

# **STUDIES OF VOLATILE ORGANIC COMPOUNDS IN AMBIENT AND INDOOR AIR IN BROOKLYN**

**YVETTE SAMUELS AND DELROY BURNETT**

**MENTORS: Dr. WILBERT HOPE AND Dr. LEON JOHNSON  
DEPARTMENT OF PHYSICAL, ENVIRONMENTAL, AND COMPUTER SCIENCES  
MEDGAR EVERS COLLEGE, CITY UNIVERSITY OF NEW YORK**

## **ABSTRACT**

Tetraglyme (tetraethylene glycol dimethyl ether) is used to scrub a variety of Volatile Organic Compounds (VOC) in gas streams. The chilled tetraglyme traps VOC as the air is bubbled through it. The VOC are dispersed in water, which is analyzed by purge and trap followed by GC/MS (Gas Chromatography / Mass Spectrometry). The total VOC were determined using the response factor for toluene. The total VOC ranged from (2-6) ppb for ambient air and (6-35) ppb for indoor air.

## **INTRODUCTION**

Brooklyn is one of the five boroughs that make up New York City with a population of approximately three million people occupying only seventy-three square miles. The Environmental Protection Agency (EPA) has registered 3,296 facilities in Brooklyn and of this number 1021 or 31% reported some form of toxic air releases. The amendment to the Clean Air Act in 1998 targeted specific measures to reduce the emissions of Volatile Organic Compounds (VOC) in the air<sup>1</sup>. VOC including benzene and its derivatives cause or contribute significantly to air pollution. Benzene concentration of 2.2 ppb in ambient air may contribute to cancer risk at 131 per million. Also, at low altitudes, VOC enhance ozone production<sup>2</sup>. We adapt the technique that utilizes chilled tetraglyme as the impinger fluid for the extraction of VOC from the air<sup>3</sup>. This preliminary study involves ambient and indoor air from two locations in Brooklyn-Red Hook and Crown Heights.

## **METHOD**

Ambient and indoor was bubbled through chilled tetraglyme. 200mL of impinger fluid was dissolved in 5ml water and analyzed using purge and trap followed by GC/MS. The flow rate ranged 0.065 to 0.190 L/min and the sampling time ranged from 5-10 hours. Total organic compounds were determined using the response factor of toluene. (See fig. 1). The Hewlett Packard NBS75K library was used to identify volatile organic compounds.

## **RESULTS**

Figure 2 and 3 represent typical chromatograms obtained for ambient and indoor air respectively. In table 1 and 2 some compounds such as benzene, toluene, 1,2,5-cyclopentatriene, 1,2-dimethyl-benzene, and p-Xylene were identified in ambient air with a quality of more than 90%. Table 3 shows that similar

compounds were identified in indoor air. Many more unidentified compounds were present as is seen from the chromatogram.

**TABLE 1. VOC IN AMBIENT AIR FOR RED HOOK**

Name of compounds	Retention time (min)
Benzene	3.627
Toluene	6.723
1,3,5-Cycloheptatriene	6.723
1,2-dimethylbenzene	9.511
p-Xylene	10.050

**TABLE 2. VOC IN AMBIENT AIR FOR CROWN HEIGHTS**

Name of compounds	Retention Time (mins)
Benzene	3.623
Toluene	6.729
1,2-dimethylbenzene	9.507
p-Xylene	9.507
1-ethyl-2-methyl-benzene	11.527

**TABLE 3. VOC IN INDOOR AIR**

Name of compounds	Retention Time (mins)
Toluene	6.73
Ethylbenzene	9.32
p-Xylene	9.52
Benzene, 1-ethyl-3-methyl	12.14
Benzene, 1,4-dichloro	12.48

Limonene	12.79
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## **TOTAL VOC DETECTED**

Indoor	35 ppb
Red Hook	6 ppb
Crown Heights	2 ppb

## **CONCLUSION**

This method seems to be effective as is proposed by Troost. We were able to trap many compounds using the chilled tetraglyme. This study is preliminary, and further analysis will be done to improve the air sampling technique.

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